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Control of *Listeria monocytogenes* on No-Nitrate-or-Nitrite-Added (Natural or Organic) Frankfurters

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Summary and Implications

The growth of *Listeria monocytogenes* on 8 brands of commercially available uncured, no-nitrate-or-nitrite-added frankfurters was evaluated over a 35 d sampling period. In addition, traditionally-cured controls, containing sodium nitrite, lactates and diacetates, were selected to compare typical *L. monocytogenes* inhibition throughout a accelerated inoculation challenge study. No-nitrate-or-nitrite-added brands exhibited a decreased lag time and shorter generation time for initiation of growth, resulting in a greater population of *L. monocytogenes* when compared to the sodium nitrite, sodium lactate/diacetate controls. Frankfurters manufactured without the direct addition of nitrate or nitrite, are at an increased risk for *L. monocytogenes*.

Introduction

Health conscientious consumers have become infatuated with the concept that minimally processed; preservative free meat products marketed as natural or organic are more nutritious and “safer” than conventionally processed products. Sodium nitrite (NaNO_2) is a common preservative found in processed meat products and has been under scrutiny by such consumers for decades. Because nitrite is a preservative, it is not allowed as an ingredient that is added directly to natural or organic products. NaNO_2 is a unique, irreplaceable ingredient that is known not only for the development of cured meat color and flavor in products such as ham and frankfurters, but for its vital role in the safety of cured meat products. Despite its proven track record for food safety, processors have begun to utilize alternative methods for the production of uncured, no-nitrate-or-nitrite-added, meat products to meet the increased demands for preservative free meat products by natural and organic consumers. Alternative methods utilize naturally occurring nitrates and nitrites found in vegetables and sea salts to result in processed meats that demonstrate typical cured meat properties including color and flavor. These processes result in typical cured meat properties but have also been found to result in greater variation of these properties than that observed for conventionally cured

meats. Consequently, the changes in ingredients and processing procedures used for natural and organic processed meats are cause for examination of these processed meat products to determine if significant foodborne hazards exist.

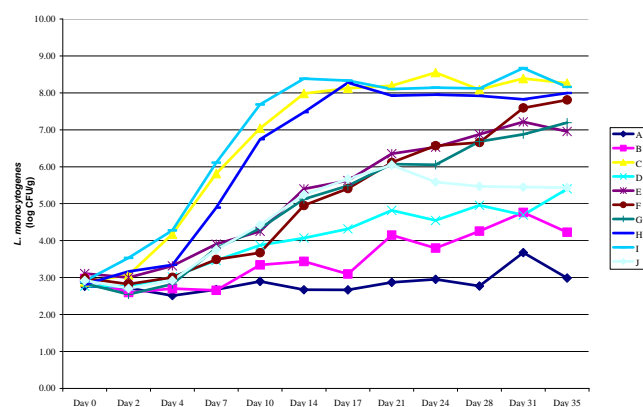
Materials and Methods

Eight brands of commercially available no-nitrate-or-nitrite-added frankfurters were selected from retail outlets for analysis. Additionally, two traditional nitrite-cured products that included lactate and diacetate were utilized as controls to demonstrate typical *L. monocytogenes* inhibition. Products were removed from packages and submerged in boiling water for 30 seconds to reduce the level of competitive lactic acid bacteria present. Whole frankfurters were then chilled to below 4°C and surface inoculated with 1 ml of a 5-strain cocktail mixture of *L. monocytogenes*. Samples were hand massaged for 10-15 seconds to distribute microorganisms, vacuum sealed and stored at 10°C for 35 days. Evaluations were performed bi-weekly by first blending whole frankfurters with sufficient 0.1% peptone water to achieve a 1:5 dilution of each sample. Appropriate dilutions were then plated on modified oxford media (MOX) and incubated at 35°C for 48 hours to allow for enumeration of *L. monocytogenes*.

Results and Discussion

Figure 1 shows the growth of all 10 commercial brands over the 35 d sampling period. Control brands A and B, containing sodium nitrite, lactate, and diacetate, resulted in little or no growth throughout the accelerated challenge study. Furthermore, it is clear that the no-nitrate-or-nitrite-added brands(C-J) were unable to repress the growth of *L. monocytogenes* throughout the 35 d sampling period. These samples resulted in a final population that was 2-5 log CFU/g greater than that of the conventionally processed controls.

Figure 1. Growth of *L. monocytogenes* on inoculated frankfurters over time at 10°C.



The inadequate control of *L. monocytogenes* exhibited by uncured, no-nitrate-or-nitrite-added (natural and organic) frankfurters can be attributed to the modification of ingredients utilized in the production of these minimally processed meat products. The results of this study indicate that additional antimicrobial measures are needed for natural and organic processed meats in order to provide consumers with the level of safety that is expected of similar conventionally cured meat products.

Acknowledgments

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